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Nuclear genome stability in long-term cultivated callus lines of *Fagopyrum tataricum* (L.) Gaertn

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Abstract

© 2017 Betekhtin et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited. Long-term cultivated *Fagopyrum tataricum* (L.) Gaertn. (Tartary buckwheat) morphogenic and non-morphogenic callus lines are interesting systems for gaining a better understanding of the mechanisms that are responsible for the genetic stability and instability of a plant tissue culture. In this work, we used histological sections and transmission electron microscopy to identify and describe the morphology of the nuclei of all of the analysed callus lines. We demonstrated that the embryogenic callus cells had prominent round nuclei that did not contain heterochromatin clumps in contrast to the non-morphogenic callus lines, in which we found nuclei that had multiple lobes. Flow cytometry analysis revealed significant differences in the relative DNA content between the analysed calli. All of the analysed morphogenic callus lines had peaks from 2C to 8C as compared to the nonmorphogenic callus lines, whose peaks did not reflect any regular DNA content and exceeded 8C and 16C for the line 6p1 and 16C and 32C for the callus line 10p2A. The results showed that non-morphogenic calli are of an aneuploid nature. The TUNEL test enabled us to visualise the nuclei that had DNA fragmentation in both the morphogenic and non-morphogenic lines. We revealed significantly higher frequencies of positively labelled nuclei in the non-morphogenic lines than in the morphogenic lines. In the case of the morphogenic lines, the highest observed frequency of TUNEL-positive nuclei was 7.7% for lines 2-3. In the non-morphogenic calli, the highest level of DNA damage (68.5%) was revealed in line 6p1. These results clearly indicate greater genome stability in the morphogenic lines.

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